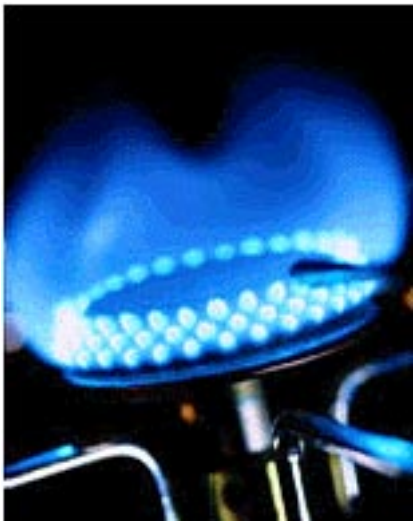
FEMP FEDERAL ENERGY MANAGEMENT PROGRAM FOCUS

U.S. Department of Energy
Energy Efficiency and Renewable Energy
SPECIAL ISSUE
September 2000

FEMP is Your Partner in Making Projects Happen!

Winter 2000/2001 Natural Gas Crisis

Lower Supply and Higher Demand = Major Price Hike



This issue of the *FEMP Focus* is intended to serve as a reminder of actions that can be taken to reduce gas costs. Federal Government facilities will face a serious budget crisis this winter as the price of natural gas rises to historic levels. These high prices provide new incentive to refocus attention on ways that Federal facilities can reduce gas costs. Tips are offered and references are provided to more exhaustive discussions of the suggested actions.

The immediate concern is with gas costs during this coming winter. However, it is anticipated that gas costs will remain at high levels for the next couple of years. So, there are two questions utility managers should ask:

- What can be done to reduce gas costs during this coming winter?
- Are there actions to be taken today that will mitigate gas costs over the next year or two?

There are three ways to reduce gas costs. First, the purchase price of fuel can be controlled. As large as the Federal Government's purchases of natural gas are, however, the Federal Government cannot affect the market price of fuels. Nevertheless, some control over fuel prices can be exercised by making sure that the least-cost per Btu fuel is purchased when a facility has dual fuel capability.

The other two ways to reduce gas costs involve conserving fuel use by altering end-user behavior, and increasing the efficiency of fuel-using processes. We will focus on these two categories to achieve results.

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Mcf, MMBtu, dTh - - Breaking the Measurement Code

Throughout this newsletter, the terms Mcf, MMBtu, and BBtu are used to indicate units of measurement. Most often, Mcf is seen in residential natural gas bills to show the number of cubic feet purchased (the letter M represents 1,000). Dekatherms (dTh) can also be seen on residential bills.

1 Mcf ≅ 1.03 MMBtu or 1.03 dekatherm
(using 1,030 Btu per cubic foot)

Measurements of natural gas usage at the office are usually measured in British Thermal Units or Btus (MM represents one million; B, one billion).

The common denominator: Btu measurement provides an easy way when comparing the unit cost of differing fuels - even electricity. It is essential in calculating when a facility has a choice of what fuel to use to run equipment.

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The *FEMP Focus* is published bimonthly by the Federal Energy Management Program of the U.S. Department of Energy/Office of Energy Efficiency and Renewable Energy.

If you are making projects happen at your Federal facility, FEMP would like to hear from you. Please submit project descriptions to Annie Haskins at the address listed below. You will be contacted for additional information if your project is selected to be featured in a future edition of the *FEMP Focus*.

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The Director's Column

Prepare for Natural Gas Budget Crunch

Beth Shearer, FEMP Director

Gasoline prices are high. How much longer will these price increases last? What else will be affected by the rising prices? We, at FEMP, analyzed the impact the Federal government faces if and when natural gas prices rise to $5 per thousand cubic feet (Mcf). Additionally, we have developed a few recommendations that may alleviate the budget crunch when natural gas (and other fuel) prices soar.

We believe FY 2001 budgets will need significant review for fuel cost changes. If the cost of natural gas goes up by $1, the annual cost to agencies is roughly $137 million. At $2 the increase doubles to about $275 million.

Recent news highlights the relationship of petroleum prices to natural gas prices. Some believe that natural gas producers are withholding production to increase the demand. Thus, the rising prices we are seeing today are also predicted for tomorrow. It is typical for natural gas to closely track fuel oil because of electric utilities' and industrial customers, ability to switch between each energy source. Slow production and high demand have thwarted efforts to store gas, a usual spring, summer, and fall activity. This keeps the price of gas up. The lack of supplies from storage may hamper deliveries on the critical winter heating days.

What can we do to hinder the growth of gas prices? The Federal Government's purchasing power cannot, itself, exert pressure on the market price of gas. Can we improve the price paid for natural gas? Not likely. In most instances, Federal agencies pay the average price in the market "hubs." Average index prices are based on the location of the wellhead production. Then there are costs to the interstate pipeline for delivering to the local gas distribution company. We do not pay the highest price, nor the lowest. At some installations, we do pay below the average price. There are some localized buying advantages that are captured by some facilities.

$1 change = $137 million for agencies

We also considered the question: Can Federal agencies switch from natural gas to fuel oil? Many installations have dual fuel capability. Like the vast majority of commercial and industrial firms, central energy plants can use either natural gas or coal or fuel oil. However, throughout the Nation many facilities are restricted in burning fuel oil for environmental reasons. These limits extend to the number of hours, the appropriate conditions, and type of low-sulphur fuel oil that can used.

Department of Energy statistics for its facilities' natural gas and fuel oil use show a remarkable decline in fuel oil use in the last decade. In addition to the local environmental restrictions, we believe this success is the direct result of objectives to reduce dependence on foreign oil. Several New York State DOE facilities made a 100-percent switch to natural gas. Some facilities switched and eliminated on-site fuel oil storage capabilities and

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What's Ahead? Here's the Natural Gas Price Forecast

Gas prices for delivery during the Winter 2000/2001 have risen to historic levels. The futures market reveals that prices are expected to recede somewhat after this winter, but remain substantially higher than gas prices have been for the past several years.

Here are the basics:

- The DOE's Energy Information Administration (EIA) projects the spot price of gas at the wellhead to remain above $4 per Mcf for the remainder of 2000 and for the first quarter of 2001.
- For all of 1999, trading prices for wellhead natural gas at the Louisiana market hub averaged $2.25 per Mcf (using 1,030 Btu per cubic foot).
- Recent futures prices for gas at the same Louisiana trading hub (September 8, 2000, at the New York Mercantile Exchange) range between $4.45 and $5.01 per Mcf for the winter months of 2000/2001.
- At least for the winter season, wellhead prices are therefore expected to be nearly double the 1999 average price.
- Depending on location, this implies delivered prices in the neighborhood of $5 to $6 per Mcf during this coming winter.

There appear to be a number of factors that have combined to cause the near-term expected increase in the price of natural gas. Rising crude oil prices have contributed, but probably more important is the fact that low gas prices over the last few years have reduced exploration and drilling. This leads to a short-term supply constraint that will require at least six months to a year to respond to today's rising prices. The construction of new gas-fired electric generation plants and hot summer weather in the West and Southwest have resulted in a significant increase in the demand for natural gas to generate electric power, which limits the amount of gas production being stored for use this coming winter.

Effect on Natural Gas Projects

The question is how long are high gas prices expected? The answer affects the payback of energy efficiency and conservation projects with longer lead times and longer lives.

- EIA forecasts show wellhead prices declining below the $3 level by the third quarter of 2001, and then rising again as the 2001/2002 winter season approaches.
- In any event, EIA forecasts prices to remain at substantially higher levels than in the past few years.
- This general price movement seems to be confirmed by the futures market, where prices at the Louisiana market hub do not fall to $3.50 per Mcf until the spring of 2002, and then remain between $3 and $3.50 per Mcf through August 2003.

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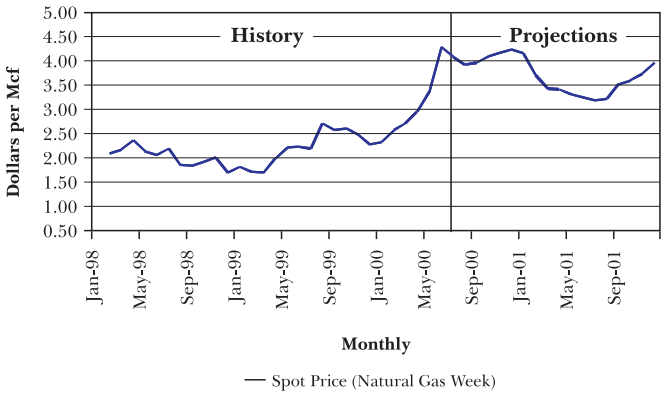
Natural Gas Wellhead Spot Prices



Sources: History: EIA and Natural Gas Week;
Projections: Short-Term Energy Outlook, August 2000.

An Operations & Maintenance Focus Lowers Cost, Drops Usage, Jumps Efficiency

Following is a list to improve fuel-use efficiency and reduce energy consumption–and the accompanying cost–at Federal facilities:

In Buildings

Check and adjust combustion efficiency of gas-fired equipment. Inspect furnaces, space heaters, and water heaters. Tune and adjust gas burners to achieve proper excess air settings and uniform, efficient combustion. Performing this maintenance can often save from 2 to 12 percent of annual fuel use. Contact the local gas utility company for assistance if needed.

Lower thermostat settings, particularly in large heated spaces during the coldest winter days. A common rule-of-thumb is that for each degree the thermostat setting can be lowered, a 3 percent reduction in fuel consumption can be achieved. Use portable space heaters to enhance personal comfort where necessary. Implement dress code changes to allow the use of warmer functional clothing.

Lower setback temperatures in buildings during unoccupied periods. For a typical building, a 10 percent reduction in annual fuel consumption can be achieved if the thermostat setting is lowered 10 degrees an average of eight hours each day. Isolate unoccupied building areas to further reduce space temperatures and provide only minimum freeze protection.

Optimize morning warmup and night setback controls. Programmable temperature controls, particularly energy management and control systems (EMCS) at large installations, are oftentimes not adjusted to coincide with building occupancy schedules as they change. Heating is needlessly activated when the buildings are not in use. Fuel savings can be achieved by updating warmup and setback control schedules to coincide with current occupancy periods in affected buildings for each heating zone and weekday.

Reduce and eliminate major sources of infiltration. Leakage of outside air into heated spaces during the coldest winter days can be the largest single contributor to the heating load in some buildings. Keep large overhead doors tightly closed in warehouses, hangars, and industrial buildings. Check and repair overhead door seals which are often deficient and can allow significant leakage. Shut off exhaust fans when not needed.

Minimize use of outside air for process ventilation. Many large installations use 100 percent outside air to ventilate hazardous areas, meaning that none of the heated air is recirculated. The heating requirement associated with these kinds of systems can be substantial. It is estimated that the fuel cost that will be incurred this year to heat one facility at one DOE site with this type of ventilation system will be about $250,000, if gas prices increase as anticipated. Verify with facility managers the cost implications of outside air ventilation in view of the higher fuel prices expected this winter, and that all available opportunities have been taken to minimize the impact.

Modify work activities to reduce heating requirements without affecting productivity. During the coldest part of the heating season, implement a 4-day work schedule for buildings that are least energy efficient. Large industrial shops having minimal insulation and high infiltration would be good candidates for this initiative. Where possible, temporarily relocate work activities from larger, less energy-efficient buildings to smaller, more efficient ones.

Minimize the use of gas-fired refrigeration equipment. Several Federal installations operate gas-fired refrigeration equipment (including absorption refrigeration and steam turbine-driven centrifugal

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AN OPERATIONS & MAINTENANCE FOCUS LOWERS COST, DROPS USAGE, JUMPS EFFICIENCY
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machines) to provide space cooling in one or more buildings. Gas-fired refrigeration equipment is typically more expensive to operate during the heating season than electric-driven equipment. The use of gas-fired refrigeration should be minimized during the winter if mechanical refrigeration is required and electric-driven equipment is available.

In Central Heating Plants

Conduct boiler efficiency tests. Boiler efficiency tests are often the only reliable way of revealing deficiencies in a heating plant and identifying problem areas that can impact fuel consumption. Boiler efficiency tests should be conducted for the largest site boilers if such testing has not been completed within the last several years.

Optimize combustion efficiency. It is important that the correct air-to-fuel ratio be maintained in boilers and that sufficient excess air is used to assure complete combustion. Maintaining too much excess air is a common occurrence and unnecessarily wastes fuel. With well designed gas-fired boilers, an excess air level of 10 percent is usually attainable. Excess air levels should be continuously monitored by utility personnel and corrected if necessary. An often stated rule-of-thumb is that fuel costs can be reduced by 1 percent, if the amount of excess air is reduced by 15 percent.

Perform boiler maintenance. Stack temperature more than 150 degrees Fahrenheit above steam temperature often indicate the presence of excessive water-side scaling, which can reduce heat transfer and increase fuel consumption by as much as 10 percent. If stack temperatures are excessive, heat transfer surfaces should be cleaned to remove scaling.

Minimize boiler blowdown. Reliable steam plant operation requires that a portion of the boiler water be discharged to drain in order to maintain acceptable solids concentrations. Blowdown rates are often excessive and waste fuel. Plant personnel should continuously monitor boiler blowdown to minimize energy losses.

Optimize steam plant heat balance. Many large steam plants use a combination of electric motors and steam turbines to drive auxiliary plant equipment. Continuous venting of large amounts of steam at a steam plant usually indicates that these drives are not optimally balanced, which can be costly when fuel prices are high and electric rates are low. Plant personnel should immediately correct these imbalances when they occur.

Minimize deaerator steam venting. Excessive steam losses in a steam plant can often be attributed to deaeration, a corrosion control process that removes air and gases from boiler feedwater. Plant personnel should be careful to minimize deaerator venting to the minimum acceptable level.

Optimize boiler loading to coordinate the operation of multiple boilers and ensure that all load conditions are met in the most efficient manner. Selected boilers should be shut down during the low load periods so that the remaining boilers can operate at higher, more efficient firing rates.

With Thermal Distribution

Inspect/replace steam traps. Steam traps are mechanical devices that remove condensate from steam piping and equipment. Hundreds of steam traps may be in service in a typical system, and it is not uncommon to find 15 to 20 percent not functioning properly. Collectively, trap losses can be significant. A single failed trap, which might cost $400 to replace, will increase fuel costs by about $2,000 this year if gas prices increase as expected. In systems with a scheduled maintenance program, leaking traps should account for no more than 5 percent of the total trap population.

Inspect/repair condensate return equipment. Inoperative condensate return equipment, like steam traps, often go unnoticed because collected condensate can be wasted to drain, while the steam system continues to function. Condensate contains useful thermal energy that can be recovered to

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LEAD by EXAMPLE... That's Our Theme to Help You

The suggestions in this special issue of *FEMP Focus* are applicable at home as well as at work. Lead By Example is Secretary Richardson's theme–and FEMP's slogan–for Federal agencies to show positive action to energy awareness, conservation and efficiency. It is also a key to mitigating the adverse budgetary and operational impact of the current natural gas crisis.

In late October, the Federal Energy Management Program (FEMP) will distribute awareness materials–similar to the Electricity Reliability initiative we started in July–to remind end users to reduce gas consumption during this winter. If energy managers need additional quantities, please call in late October the Energy Efficiency and Renewable Energy Clearing House (EREC) at 1-800-363-3732, or order online at www.eren.doe.gov/femp/ordermaterials.html.

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offset fuel costs. If condensate is returned to a steam plant, fuel costs will typically be reduced by about 10 percent.

Locate/repair steam leaks. Steam leaks can also be significant. A continuous steam leak with a visible plume only a few feet in length will likely cost about $8,000 in additional gas purchases this year if no corrective action is taken. Steam leaks can also be indicative of indifference to an efficient operation, as well as pose a significant safety hazard.

Repair insulation. Up to one-quarter of total heating system fuel costs can be attributed to the thermal losses from distribution piping, valves, and equipment. Deteriorated or missing insulation from a 10-foot section of a 6-inch steam line, for example, will increase gas costs by about $1,000 this year if left unrepaired. An uninsulated 6-inch steam valve will cost about $300 in additional gas purchases. Thermographic instruments and infrared pyrometers can be helpful in surveying steam lines and identifying areas needing repair.

Isolate non-essential distribution piping. Changing missions have reduced the steam requirements at many sites. Steam distribution systems may no longer be optimally configured to serve facility loads. Opportunities may exist to discontinue operation of major sections of a distribution system originally designed to supply much larger loads, allowing existing loads to be served by other more efficient means. The avoided distribution losses can be substantial. Fuel purchases attributable to thermal losses from a typical 6-inch steam line 1,000-feet in length, for example, will cost about $12,000 this year at the anticipated higher gas price.

Reduce distribution pressure. Load reductions that have resulted from changing missions and energy conservation measures may also afford the opportunity to lower steam pressures in existing distribution systems to achieve a corresponding reduction in thermal losses. For example, lowering the average distribution pressure in 1,000 feet of 6-inch steam line from 120 to 80 psig would reduce distribution losses by about 10 percent, saving about $1,200 in gas purchases this year.

The Magnitude of the Problem
$5 to $6 Gas

The operations and maintenance (O&M) budgets of Federal facility and building managers will be significantly affected by the projected price increases for natural gas for the upcoming winter season. The delivered price of gas is projected to range roughly between $5 and $6 per MMBtu for most Federal facilities.

Consider the expenditures on natural gas for standard building services and energy-intensive facilities. According to information presented within the U.S. Department of Energy's *Annual Report to Congress on Federal Government Energy Management and Conservation Programs: Fiscal Year 1999 (draft),* the Federal Government consumed approximately 136.6 trillion Btus of energy, for a total expenditure of just over $520 million, for an average delivered price of just under $4 per MMBtu.

To get some idea of the potential impact of a natural gas price increase, the accompanying table on page 9 shows the seven agencies that accounted for 92 percent of Federal natural gas consumption that was allocated specifically to standard building services and energy-intensive facilities, in fiscal year 1999. Additionally, the bottom of the table provides a summary total for the two dozen-plus Federal agencies.

As an illustrative example, the table shows the impact that results from each $1 increase in the annual average delivered price of gas. For the Federal Government as a whole, such an impact would amount to approximately $137 million in additional expenditures on standard building services and energy-intensive facilities. It is possible agencies could experience an increase of at least $2 per MMBtu. This $2 change would imply an annual increase in gas costs in excess of a quarter of a billion dollars.

Most of the impact (92 percent), as can be surmised from the Table on page 9, would be shared among the Departments of Defense, Veterans Affairs, Energy, Justice, Health and Human Services, the General Services Administration, and U.S. Postal Service.

The impact of rising natural gas prices on the O&M budgets for facility and building managers could obviously be substantial. Reexamining and implementing demand-side conservation and efficiency programs are steps managers can take to mitigate any adverse impact.

Calculate the Revised FY 2001 Budget

Prices Paid ($)	**1** Enter the price you expect to pay for natural gas in 2001. This should be in dollars per Mcf, MMBtu, or dTh ($/Mcf, $/MMBtu, $/dTh).	1	$	/unit
	2 Enter the price paid for natural gas in 2000. Again, this should be in dollars per Mcf, MMBtu, or dTh ($/Mcf, $/MMBtu, $/dTh).	2	$	/unit
	3 From line 1, subtract line 2.	3	$	/unit
Quantity Purchased	**4** Enter the quantity of natural gas to be purchased in 2001. The units must be the same as above (Mcf, MMBtu, or dTh).	4		units
Budgetary Effect	**5** Multiple line 3 and line 4.	5	$	/unit
Price Increase as a Percentage	**6** Divide line 3 by line 2.	6		
	7 Multiply line 6 by 100. This is the percentage by which the price increases.	7		%

Federal Agencies' Natural Gas Consumption and Expenditure for Standard Building Services and Energy-Intensive Facilities, Fiscal Year 1999

Impact of $1 Per MMBtu Increase in the Price of Natural Gas (Thousands of Dollars)

Federal Agencies (Ranked by Impact)	Total Consumption (BBtu)	Total Expenditures ($ 000)	Average Price ($/MMBtu)	Additional Expenditures Resulting from $1 Price Increase ($ 000)
	A	B	C=B/A	D=A * $1/MMBtu
Department of Defense	86,028.9	$316,442.9	$3.68	$86,028.9
Department of Veterans Affairs	14,270.3	$50,317.0	$3.53	$14,270.3
United States Postal Service	7,500.2	$38,240.0	$5.10	$7,500.1
Department of Energy	6,767.1	$24,168.7	$3.57	$6,767.1
Department of Justice	4,458.6	$20,044.8	$4.50	$4,458.6
Department of Health and Human Services	3,288.1	$10,885.0	$3.31	$3,288.1
General Services Administration	3,154.7	$14,773.4	$4.68	$3,154.7
All Reporting Civilian Agencies & DOD Total	**136,594.8**	**$520,367.1**	**$3.81**	**$136,594.8**

Federal Agencies Annual Energy Management Data Report information as presented in the DOE's *Annual Report to Congress on Federal Government Energy Management and Conservation Programs: Draft Fiscal Year 1999*, pp. 53, 77-133.

All natural gas usage and cost data referenced are for standard building services (i.e., systems such as air conditioning, heating, lighting, and ventilation) and energy-intensive facilities. This usage and cost data does not reflect leased government space arrangements where utilities are paid by the landlord.

Regarding Steam Traps

Steam is often used for laboratory R&D and for space conditioning. A recent Federal Technology Alert addressed "Steam Trap Performance Assessment." Steam traps are automatic valves every steam system uses to remove condensate, air, and other non-condensable gases. These items reduce the efficiency of the steam system and increase the cost of steam. Approximately 20 percent of the steam leaving central boiler plants is lost through leaking traps. The tech alert recommends low-cost portable testing/assessment equipment. The savings associated with using this type of equipment in the Federal Government are estimated at $80 million. The average investment payback is less than 6 months. There are several vendors of this equipment. For more information visit www.eren.doe.gov/femp/prodtech/steamtrap1.html.

As stated in the "Steam Trap Performance Assessment," various types of performance assessment equipment can be used as part of a proactive steam trap maintenance program to significantly reduce energy losses in steam distribution systems.

Home Energy Checklist

Here is a simple checklist of energy conservation/efficiency measures that can be taken at home:

Today

- **Turn down the temperature** of your water heater to the warm setting (120°F). You'll not only save energy, you'll avoid scalding your hands.
- **Check if your water heater has an insulating blanket**. An insulating blanket will pay for itself in one year or less!
- **Make your bed today** if you have one of those silent guzzlers, a waterbed. The covers will insulate it, and save up to one-third of the energy it uses.
- **Start using energy-saving settings** on refrigerators, dishwashers, washing machines, and clothes dryers.
- **Survey your incandescent lights** for opportunities to replace them with compact fluorescents. These new lamps can save three-quarters of the electricity used by incandescents. The best targets are 60-100W bulbs used several hours a day. Measure the clearance in the fixtures to make sure they will accommodate compact fluorescents, which are slightly bigger than incandescents.
- **Check the age and condition of your major appliances**, especially the refrigerator. You may want to replace it with a more energy-efficient model before it dies.
- **Clean or replace furnace**, air-conditioner, and heat-pump filters.

This Week

- **Visit the hardware store**. Buy a water-heater blanket, low-flow showerheads, faucet aerators, and compact fluorescents, as needed. If you can't find compact fluorescents locally, check out ENERGY guide (www.energyguide.com) or Energy Federation Incorporated (www.efi.org).
- **Rope caulk** very leaky windows.
- **Assess your heating and cooling systems**. Determine if replacements are justified, or whether you should retrofit them to make them work more efficiently to provide the same comfort (or better) for less energy.

This Month

- **Collect your utility bills**. Separate electricity and fuel bills. Target the biggest bill for energy conservation remedies.
- **Crawl into your attic or crawlspace** and inspect for insulation. Is there any? How much?
- **Insulate hot water pipes and ducts** wherever they run through unheated areas.
- **Seal up the largest air leaks in your house** -- the ones that whistle on windy days, or feel drafty. The worst culprits are usually not windows and doors, but utility cut-throughs for pipes ("plumbing penetrations"), gaps around chimneys and recessed lights in insulated ceilings, and unfinished spaces behind cupboards and closets. Better yet, hire an energy auditor with a blower door to point out where the worst cracks are. All the little, invisible cracks and holes may add up to as much as an open window or door, without you ever knowing it!
- **Install a clock thermostat** to set your thermostat back automatically at night.
- **Schedule an energy audit** (ask your utility company or state energy office) for more expert advice on your home as a whole.

This Year

- **Insulate**. If your walls aren't insulated have an insulation contractor blow cellulose into the walls. Bring your attic insulation level up to snuff.
- **Replace aging, inefficient appliances**. Even if the appliance has a few useful years left, replacing it with a top-efficiency model is generally a good investment.
- **Upgrade leaky windows**. It may be time to replace them with energy-efficient models or to boost their efficiency with weatherstripping and storm windows.
- **Reduce your air conditioning costs** by planting shade trees and shrubs around your house -- especially on the west side.
- **Know that you are making a difference**!

These tips were taken from www.aceee.org/consumerguide/index.htm. For additional information on home energy conservation/efficiency measures, visit www.energy.ca.gov/consumer/home/index.html and http://homeenergysaver.lbl.gov/hes/answerdesk_dat.html.

Conservation/Efficiency Measures - What Federal Employees Can Do to Help

In the face of rising natural gas prices, the Federal Government must be prepared to take immediate as well as longer-term actions to reduce gas consumption and increase efficiency in its buildings and facilities. Behavior-based change is an important component of any effort to conserve energy. The July 2000 issue of the *FEMP Focus* (www.eren.doe.gov/femp/newsevents/femp_focus/july00_contents.html) reported on the Government's initiative to help prevent power outages, including encouraging changes in end-user behavior to reduce the consumption of electricity at Federal facilities. Most of the general principles discussed and many of the behaviors suggested would also be useful/applicable in addressing the need to reduce Federal facilities' consumption of natural gas (www.eren.doe.gov/femp/newsevents/femp_focus/july00_plan_ofaction.html). As well, cutting electricity consumption indirectly helps conserve natural gas since a lot of utilities use gas-fired plants to generate electricity. Furthermore, reducing the overall demand for and increasing the supply of natural gas in this way would help exert downward pressure on the price of natural gas.

There are many ways that Federal workers can contribute to the Government's conservation efforts by the choices they and their co-workers make every day. It is crucial to emphasize the importance of taking actions both on the job and at home.

Recent FEMP pilot studies of military housing residents provide guidance for enlisting energy end-users in the effort to reduce energy consumption. The results of these studies, which can be applied in large part to Federal workers in general, clearly indicate that end-users need to both be motivated and provided practical information.

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Act Now to Reduce Fuel Costs

In Your Buildings

- Check/adjust combustion efficiency of gas-fired equipment
- Lower thermostat settings
- Lower setback temperatures
- Optimize morning warmup and night setback controls
- Reduce/eliminate major sources of infiltration
- Minimize use of outside air for process ventilation
- Modify work activities
- Minimize the use of gas-fired refrigeration equipment

In Central Heating Plants

- Conduct boiler efficiency tests
- Optimize combustion efficiency
- Perform boiler maintenance
- Minimize boiler blowdown
- Optimize steam plant heat balance
- Minimize deaerator steam venting
- Optimize boiler loading

With Thermal Distribution

- Inspect/replace steam traps
- Inspect/repair condensate return equipment
- Locate/repair steam leaks
- Repair insulation
- Isolate non-essential distribution piping
- Reduce distribution pressure

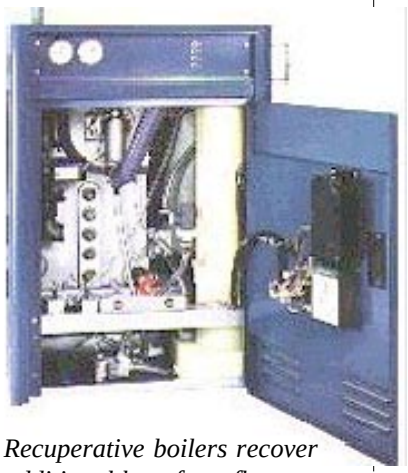
Is Your Equipment a Klunker?

Equipment that continues to perform poorly due to age or wear should be replaced. But don't just blindly replace existing equipment with the same grade of equipment. Remember that equipment purchased today could last for 10, 20 or even 30 years. Why get stuck with a klunker? Take advantage of the great strides toward increasing the efficiency of heating equipment through improved design and new technologies.

Executive Order 13123 directs agencies to retire inefficient equipment on an accelerated basis where replacement results in lower life-cycle costs. Fuel price increases can often justify upgrading to more efficient equipment. Additionally, the newer equipment will result in lower maintenance costs in the short term, especially during the warranty period, and often during the long term.

Most of today's efficiency gains are found in equipment--controls, burners, water heaters, furnaces, and boilers. Burners are not only more fuel efficient, but also less polluting. Controls are now digital and can do a better job controlling combustion through all load levels. Insulation for furnaces and boilers have improved. New technologies such as condensing boilers and pulse combustion boilers push efficiency levels to their limits. The time to investigate these possibilities is now!

A good place to start the investigation is www.eren.doe.gov/femp/procurement. The site will provide recommended efficiency levels for water heaters, furnaces and boilers. Afterward a search of www.eren.doe.gov will yield more detailed information. Product suppliers can then be contacted for availability, prices, and to discuss special site conditions such as the compatibility of burners with boilers.



Recuperative boilers recover additional heat from flue gases.

Do Research Online

The Federal Energy Management Program (www.eren.doe.gov/femp/) offers a number of useful online resources for promoting energy conservation/efficiency. For ten simple steps to save energy at the office, go to www.eren.doe.gov/femp/yhtp/tips.html. For guidance on purchasing energy-efficient products for Federal facilities, see www.eren.doe.gov/femp/procurement/.

Additional information on energy-efficient products is available at www.energystar.gov and http://pub.fss.gsa.gov/environ/. The ENERGY STAR® Web site also offers guidance on purchasing energy-efficient products for the home.

FEMP's *Greening Federal Facilities* is an excellent guide for Federal facility managers and covers specific ways to reduce energy consumption and costs. The guide can be found at www.eren.doe.gov/femp/greenfed/.

If you would like to conduct a campaign to reduce energy end-use at your facility, the *Handbook for Promoting Behavior-Based Energy Efficiency in Military Housing* provides tips and strategies. It also suggests a number of changes and improvements that employees can make at home. The handbook, as well as other resources, is available at www.eren.doe.gov/femp/yhtp/strategies.html.

Additional materials to assist Federal agencies and State energy offices—when seeking assistance from end-users in the effort to reduce energy consumption—are available from the Energy Efficiency and Renewable Energy Clearing House at 1-800-363-3732 or can be ordered online at www.eren.doe.gov/femp/ordermaterials.html.

The Office of Industrial Technologies offers more detailed information on conservation and efficiency measures involving industrial/process equipment, at www.oit.doe.gov/steam/files/tips.shtml and www.oit.doe.gov/steam/steamsys/handbook/handbook.html.

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A Case Study: Huge Hanford Savings Demonstrate ESPC Benefits

As one of DOE's first Super ESPC projects, there was a lot of fanfare surrounding the Hanford Site in 1996. Most of the focus at the time was on the huge distributed steam system that was being installed to replace aging coal- and oil-fired plants. But four years into the 25-year ESPC, it is the savings that gain attention.

DOE's Hanford Site is a 560-square mile complex owned by DOE about 220 miles southeast of Seattle, WA. Through an energy savings performance contract (ESPC) with Johnson Controls, Inc., the Hanford site has reduced annual energy consumption by up to 65 percent from 1996 levels, cut water losses by more than 85 percent, eliminated more than 600 tons of harmful emissions and is saving $108 million over 25 years.

The utility services portion of the contract has four components:

- Unbundling the fuel supply into commodity, transportation services and local distribution expenses that maximize the energy savings available from the competitive retail energy supply market.
- Procuring appropriate fuel.
- Providing fuel nomination, scheduling and balancing services to ensure energy delivery and to minimize supplier penalty charges.
- Providing energy trending, energy accounting and reporting services to help the ESPC to manage its future price risk through hedging techniques.

Volume and Pricing Analysis

The starting point was a comprehensive, natural gas and diesel volume and pricing analysis. After Johnson Controls utility specialists analyzed the current volume, they performed a review and evaluation of seasonal usage versus baseload usage and determined whether the energy load was firm, interruptible, or some combination.

For natural gas pricing, they used a combination of bundled "city gate" pricing (a set price for the natural gas delivered to the connection of the interstate pipeline and the local natural gas utility) and unbundled local distribution prices. Johnson Controls also negotiated unbundled wellhead-to-burner-tip pricing. They handled nominating, scheduling, and balancing fees as well as local distribution charges.

For the boilers using diesel fuel oil, Johnson Controls again performed a volume analysis, and reviewed and verified the seasonal usage versus base loads. This comprehensive examination of the service characteristics included questions, such as: How is the facility planning on using the fuel? How will the usage break down by boiler annex? What protocols are established to communicate the inventory levels? What improvements are

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New distributed boilers at the Hanford complex run on natural gas, saving energy and reducing environmental emissions.

Consider Switching Fuel Sources

But Tune the Equipment First

Central heating plants and even some boilers serving single buildings at Federal facilities have the capability to burn more than one fuel. As a general rule, fuel oil, liquid petroleum gas and natural gas prices tend to fluctuate together. However, special local circumstances may allow fuel sources to be switched to mitigate price increases or supply shortages.

Of course, having the alternate fuel capability is not much help if the equipment is not in good working order. That's why it is important *before* the beginning of winter to inspect, test, and refurbish all the fuel burning systems–from the fuel tanks through the burners. A safety inspection is extremely important. Operators may need to re-familiarize themselves with the procedures for fuel switching and ignition.

Operating or equipment inefficiencies can quickly erode any price advantage from switching. Fuel switching can occur when heating is needed most. That is, when the greatest amount of fuel is burned, even small inefficiencies can result in large amounts of fuel being wasted. The effect upon the pocketbook and environment can be unpleasant.

WINTER 2000/2001 NATURAL GAS CRISIS
continued from page 1

Leading by example is the key to mitigating the adverse impacts of the current fuel crisis. The main objective is to reduce the dollar impact on Federal facilities and also alleviate the supply problem nation wide. The suggestions and recommendations in this issue may be applicable at home as well as at work.

New Wine in Old Bottles?

Dust Off Old Projects, Think Anew

Historically high prices for natural gas provide reason to reconsider the economics of projects that may have been dismissed during the period of low natural gas prices. For example, certain efficiency/conservation projects that had unattractive paybacks at $3 delivered gas may become quite attractive at $5 or $6 delivered gas prices. Thus, utility managers are urged to dust off and reconsider projects that were judged marginal during the last few years. Speed up other projects that are in the pipeline to provide nearer-term savings, hopefully reducing gas costs this coming winter.

Consider Alternative, Clean Technologies

Higher gas prices may also change the economics of alternative, clean technologies. The cost of generating power using renewable energy sources has been uneconomic compared to the cost of using conventional sources. Increasing prices in traditional energy markets may make renewable technologies economically viable at the margin and capable of competing with conventional fuels.

Promoting energy efficiency, expanding the use of renewable energy products, and assisting in the development of renewable technologies are goals set out in Executive Order 13123, *Greening the Government through Efficient Energy Management,* found at www.eren.doe.gov/femp/aboutfemp/exec13123.html.

Renewable energy, as defined by the E.O., is energy produced by biomass, geothermal, solar, and wind power. Renewable technologies produce electricity, gas, heat, and steam. Satisfying energy requirements with renewable energy sources produces many positive "side-effects," including reductions in the emissions of certain pollutants, increased fuel diversity, and employment and economic benefits.

Utility managers are urged to review again renewable options that might now be significantly more competitive given the expected high price for gas and other fuels.

Review Interruptible Natural Gas and Propane Services

Some Federal facilities use propane as a heating fuel, in conjunction with natural gas. Propane, also known as LP-gas, is customarily sold at a higher price than natural gas. When propane is employed as a heating fuel, it is usually used to provide back-up for an interruptible natural gas supply contract.

Interruptible natural gas service can be halted in times of peak use or when natural gas supplies are low; therefore, the service is sold at a discount. Consequently, the natural gas/propane arrangement can be profitable to a Federal site when the savings provided through an interruptible natural gas contract outweighs the cost of employing the higher cost propane on a limited basis.

Think About the Cost

Considering the forecast for tight natural gas supplies over the winter months, facilities that use interruptible natural gas, supplemented with propane, may face additional financial burdens. If interruptible natural gas service is suspended for a longer-than-expected period of time, then these facilities will have to consume more higher-cost fuel, propane. As a result, cost savings may disappear.

Facility managers may want to revisit the financial feasibility of interruptible natural gas contracts in light of possible limited natural gas supplies, increased curtailments, and the higher relative price of propane.

Capturing the Value of Steam Efficiency Workshops

The Steam System Workshop is a one-day program intended for industrial and commercial boiler operators. If you are responsible for maintaining reliable, safe, and cost-effective steam operations, this event is for you! Become familiar with technical resources that can be used immediately, including tips sheets, case studies, and technical references. Learn about ways to audit energy usage and maintain optimal operating conditions. Be sure to collect information on ways to finance improvements and demonstrate positive financial impact on the bottom line of your operations.

Tulsa, OK	Oklahoma City, OK
Sept. 26, 2000	Sept. 27, 2000

$59 registration fee for each date. Fee covers continental breakfast, lunch, and materials. Please respond to Linda Cartwright, Oklahoma Natural Gas Company 918-831-8301.

Kansas City, KS	Wichita, KS
Sept. 19, 2000 *or* Sept. 20, 2000	Sept. 21, 2000

$50 registration fee covers continental breakfast, lunch, and materials. Please respond to Melissa Kessler - Hughes Machinery - 913-492-0355.

For more information on these courses, visit the OIT Web site at www.oit.doe.gov/bestpractices. Throughout the fall and winter, please check OIT's Web site for additional training and a great deal of related energy efficiency guidance.

Northeast Green Power Summit

In response to the current energy situation, FEMP, the Seattle Regional Office, and the Federal Network for Sustainability are co-sponsoring a regional event that will bring together Federal agencies, states, utilities, and others interested in procurement of green power. Now, more than ever, green power resources have a momentous opportunity to stabilize energy costs for power users, as those resources are not subject to fuel price volatility. Topics include: Federal leadership in the changing energy marketplace, Federal sector case studies and purchasing strategies, and government programs such as Wind Powering America, GeoPowering the West, the Bioenergy Initiative, and Million Solar Roofs.

When: Sept. 28-29, 2000
Where: Seattle, WA

Contacts: Curtis Framel (DOE, SRO), 206-553-7831
Lori Simanton, 509-946-9900
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A CASE STUDY:
HUGE HANFORD SAVINGS DEMONSTRATE ESPC BENEFITS
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required? What types of emergency service is required on the part of the supplier?

The diesel pricing analysis accounts for the historic volatility of the diesel fuel oil prices and opportunities for price risk management. As it turned out, none of the potential diesel fuel oil suppliers offered any pricing program other than the spot price "off the rack." (Note: In other areas of the country, such as New York and Texas, a price-managed service is available.)

Ongoing Responsibilities

Fuel procurement is an ongoing responsibility for Johnson Controls. For natural gas, this includes development and tracking of the actual price against the contracted price, the release of excess pipeline capacity, and the reconciliation of nominations with actual usage. Diesel fuel oil management is more complicated. Tank level readings are manually entered into the fuel oil inventory spreadsheet, and interpolation algorithms complete the entries for which no actual read was taken.

The Hanford Site, which was a 1999 DOE Energy Award winner, works to maintain its energy-saving pace for the rest of the 25-year contract.

Benefits of Utility Services Contract

- Knowledge - Baseline information helps predict budgeting needs.
- Stability - Planning for energy needs avoids market volatility.
- Economic - $108 million in reduced energy and operational costs.
- Efficiencies - Utility negotiations handled through contractor expertise.
- Intangibles - Reduced utility emissions help the environment.

For more information, contact DJ Ortiz at U.S. Dept. of Energy, Richland Operations Office, E-mail: Dickie_J_Ortiz@rl.gov; or Bob Widgeon at Johnson Controls, Inc., E-mail: robert.e.widgeon@jci.com.

Upcoming Issues of the *FEMP Focus*

October 2000
Partnerships/Energy Awareness

Special Issue
Executive Order 13123 Guidance

November/December 2000
Special Federal Energy and Water Management Awards Issue

PREPARE FOR NATURAL GAS BUDGET CRUNCH
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cannot return to burning fuel oil. This scenario may be similar for other agencies.

A Few Suggestions and Ideas

There is immediate agreement that Federal agencies can reduce the budget "shock" of $5 or $6 gas. Here are some of the ideas and plans we think will be effective:

- Energy management initiatives should focus on natural gas supplies and cost factors to ensure budgets and operations are modified appropriately. This special issue of the *FEMP Focus* should help this effort.
- Become more aggressive in natural gas conservation and efficiency.
- Work with the FEMP regional offices to implement demand-side efficiencies where possible. These are a few suggestions
  - Evaluate modifications to the work week that allow for lower energy use without affecting productivity (for example, 4-day work weeks).
  - Lower overall building temperatures and substitute with temporary personal electric space heating where needed.
  - Evaluate air flow losses of heat and adjust where possible without affecting worker health.
  - In cafeterias, for selected months, substitute recyclable products (paper and plastics) for utensils that have to be washed, reducing the amount of heated water needed.
  - Where possible, shut off heated space that is unoccupied or otherwise not needed for mission critical activities.
  - Implement heating season dress code changes to allow use of warmer functional clothing in the workplace.
- Emphasize improving the efficiency of gas-fueled equipment. Boiler efficiency can improve with routine cleaning, tube replacements, burner tests, etc.
- Adjust water heating to lower temperatures during off-peak hours. Water heaters can be checked for burner and overall efficiency.
- Refresh your skills and techniques with training offered by manufacturers and gas utilities.
- Seek the latest low-cost technology to improve the product from gas-fueled equipment–that is, for steam or hot water heating.
- Look at ESPCs and utility incentive contracting as a vehicle to complete needed natural gas projects. With higher gas/fuel prices, these may have reasonable payback terms.
- Contact the local natural gas distribution utility and start a dialogue and working relationship toward more efficient use of natural gas.
- Let us know how we may assist. Check our Web site for added information (www.eren.doe.gov/femp).

These are a few ideas, plans, and goals FEMP believes will help Federal agencies with rising gas prices. In further brainstorming, with your colleagues, expand and refine the above ideas and, perhaps, develop others. In the next several weeks many of these ideas and a new gas-focused direction can start. Hopefully, the benefits will show up on agency gas bills this winter.

If we address these budget and supply issues soon, the "pain" may be more manageable.

Beth Shearer, Director
Federal Energy Management Program

WHAT'S AHEAD?
HERE'S THE NATURAL GAS PRICE FORECAST
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- This development suggests that the market is hedging against the possibility of delivered prices between $3.50 and $4.50 for the next three years.

Alternative Fuel Prices

Prices of alternate fuel oils can be expected to move in a similar fashion to natural gas prices. However, relative prices per MMBtu for alternate fuels can be expected to change over the next year or so as market adjustments work themselves out.

- The EIA, for example, forecasts that natural gas will lose its price advantage over residual fuel oil by the end of the summer, and remain more expensive throughout 2001.
- Federal facilities with dual fuel capability should prepare to switch fuels if the EIA forecast of relative prices materializes in their areas.

DO RESEARCH ONLINE
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Technical information on combined cooling, heating, and power systems is now available in the FEMP's *Combined Heat and Power: A Federal Manager's Resource Guide* at www.eren.doe.gov/femp/resources/chpguide.html.

Finally, for links to a variety of energy conservation/efficiency Web sites, visit www.energyideas.org/energy_solutions/list_all.cfm?vtype=web.

CONSERVATION/EFFICIENCY MEASURES - WHAT FEDERAL EMPLOYEES CAN DO TO HELP
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In the case of both military housing residents and Federal employees in general, the end-user is usually not paying the energy bill, so it is important to focus on the non-economic factors that would motivate the end-user to change his/her behavior. People tend to be most motivated about energy conservation when they feel that everyone is making some sacrifices, that they are personally making a difference, and that their efficient behavior generates benefits for them (e.g., increased personal comfort). It may also be helpful to appeal to end-users' sense of patriotism, environmentalism, and their general desire to "do the right thing."

Successful campaigns for reducing energy end-use call for several key ingredients:

- the enthusiastic support of all levels of management;
- the use of familiar communication channels; and
- the illustration of efficient behavior through both visual and auditory methods (e.g., demonstrative videos as well as posted billboards/placards).

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